(5) heterozygotes; in the numerous cases where heterozygotes differ from either parent, "the ability to transmit certain characters is correlated with other *apparent* characters." Under gametic correlations are placed the phenomena of partial and complete "coupling," so called, developed chiefly by BATESON.—R. R. GATES.

Tyloses in ferns.—It has been noted by various writers that in the stems and petioles of ferns the protoxylem groups suffer disintegration, and into the cavities so formed the wood-parenchyma grows, forming the "cavity-parenchyma" of Russow. Proliferations from these cells frequently fill the cavities, and present the appearance of tyloses. These growths have recently been studied in detail by two independent workers, KIRSCH[21] and Miss MCNICHOL.[22] Both writers show that the phenomenon is widespread, being found in nearly every family of the true ferns, as well as in Marsilia and the Ophioglossaceae. In both papers the cells in question are carefully described and their origin as stated above is proven. KIRSCH has studied *Pteris aquilina* in most detail, and finds cavity-parenchyma in the stipe and in all regions of the rhizome, where it occurs in the outer system of bundles which he erroneously regards as cortical (p. 388). He offers the following as a theory of the cause of these growths: the cavity formed by disintegration of the protoxylem at first functions as a water duct; later the metaxylem (secondary xylem according to KIRSCH) makes its appearance and performs the duty of water carrier. Hence the pressure in the cavity is reduced, and as a consequence tyloses grow into it.—M. A. CHRYSLER.

Composition of a field of maize.—A brief paper by SHULL[23] calls attention to the view, already expressed by DEVRIES and others, that a field of corn, like wheat and other grains, is made up of a number of elementary species or biotypes. He discusses the fact that inbreeding in corn results in deterioration, and points out that the old hypothesis that the deleterious effects of inbreeding result from the accumulation of disadvantageous individual variations to form an organism with an inharmonious or unbalanced constitution, is untenable, in view of the facts of cleistogamy, self-pollination, and parthenogenesis in plants which have evidently been successful in the struggle for existence. A cornfield is conceived to be a series of hybrids between elementary species, and on the basis of the common observation that hybrids between nearly related forms are more vigorous than either parent, he believes that over-selection, which eliminates down to a single biotype, results in deterioration, not intrinsically from inbreeding, but because the greater vigor which comes from the crossing of biotypes has been eliminated. The

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[21] KIRSCH, SIMON, On the development and function of certain structures in the stipe and rhizome of *Pteris aquilina* and other Pteridophytes. Trans. Royal Soc. Canada III. 14:353–412. *figs. 27+21.* 1907.

[22] MCNICHOL, M., On cavity parenchyma and tyloses in ferns. Annals of Botany 22:401–413. *pl. 25.* 1908.

[23] SHULL, GEO. H., The composition of a field of maize. Amer. Breeders' Assoc. 4:pp. 6. 1908.

ideal of the corn-breeder should then be continuous hybridization between biotypes, rather than the isolation of pure strains.—R. R. GATES.

Isolation and mutation.—While the final adjudication of the claims of the various theories of evolution must be made on an experimental basis, such data must be in harmony with the facts of plant and animal distribution, as is pointed out in a suggestive paper by LEAVITT.[24] It is of much interest to observe that zoologists, as a rule, have been less inclined to believe in mutation than have botanists. This is in part due, LEAVITT thinks, to a less perfect grasp of the theory by some of the zoologists, but in part due also to the fact that most students of animal distribution believe that isolation of closely related species is a most important principle in evolution. The author shows that there are innumerable cases of overlap in closely related plants of all groups, most notable, perhaps, in the widely varying thallophytes and bryophytes, but abundant in the seed plants. There is plenty of evidence that new species may have originated from the old without geographic isolation, although cases suggesting the latter are not wanting. Therefore, it is concluded, many facts of plant distribution favor the mutation theory, though they do not show that this is the only valid theory of evolution.—H. C. COWLES.

Osmotic properties of root hairs.—HILL[25] has investigated the osmotic properties of the root hairs of *Glyceria maritima*, *Suaeda maritima*, and *Salicornia herbacea*, which grow in a salt marsh subject to great changes in the osmotic pressure of its soil water, due to periodic flooding by the tides and to occasional drenching rains. He finds that the hairs show marked and rather rapid variation in osmotic pressure corresponding in variation to the osmotic pressure of the soil water. This variation is not due to the entrance of the abundant chlorids of the soil water, for in no case could he find chlorids in the root hairs, although they could be found in traces in the upper portions of the seedlings. The high osmotic pressure of the soil water seems to act through the irritability of the protoplasm, causing a dissociation of the compounds of the cells. He thinks OSTERHOUT is wrong in concluding that osmosis is not an important process in plant nutrition, and points out the fact that all the data of this investigator can be explained by the fact that plants can modify their osmotic properties readily in response to and in protection against rapidly varying external osmotic pressures.—WILLIAM CROCKER.

Statolith theory.—BUDER[26] comes to the support of the statolith theory with a set of well-chosen and critical experiments that seem to justify his conclusions,

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[24] LEAVITT, R. S., The geographic distribution of nearly related species. Amer. Nat. **41**:207–240. 1907.

[25] HILL, F. G., Observations on the osmotic properties of the root hairs of certain salt marsh plants. New Phytologist **7**:133–142. 1908.

[26] BUDER, JOHANNES, Untersuchungen zur Statolithenhypothese. Festschrift zur Feier des 25-jährigen Bestehens der Deutsch. Bot. Gesells. Ber. **26**:162–193. 1908.